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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Complete specification in connection with Application No. 2002327081 for a patent by MARS INCORPORATED as filed on 23 December 2002.

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Fourteenth day of January 2004

J. Billingsley

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

P/00/011 28/5/91
Regulation 3.2(2)

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

Application Number:

Lodged:

Invention Title: SHELF-STABLE CONFECTIONERY

The following statement is a full description of this invention, including the best method of performing it known to :- us

SHELF STABLE CONFECTIONERY

FIELD OF THE INVENTION

This invention relates to a novel confectionery and a process for preparing said novel confectionery. The confectionery comprises a chocolate core surrounded by a sugar-based coating.

BACKGROUND OF THE INVENTION

Various confectionery products are known which incorporate chocolate within an outer sugar-based coating or shell. Such products include M&M's® (of Effem Foods) and SMARTIES® (of Nestle) and other similar confectionery products. These products have enjoyed wide consumer appeal and vast quantities of these products have been sold throughout the world. One problem of some such confectionery products is maintaining shelf stability at elevated ambient temperatures. At elevated ambient temperatures the internal chocolate melts and expands, which can cause the coating, or shell, to crack. The internal, molten, chocolate can then ooze out through the cracks which disfigures the confectionery product. This significantly reduces the consumer appeal and, therefore, the value of the products. The limited shelf stability at elevated ambient temperatures of these types of confectionery products has limited the commercial success of such products in countries having warmer climates and/or where refrigeration is not widespread. This lack of shelf stability at elevated ambient temperatures can limit the market appeal of such confectionery products as, in hot weather or when exposed to direct sunlight, the coating can crack and the inner chocolate ooze out.

A variety of means have been attempted to produce a commercially acceptable confectionery, having a chocolate centre and a sugar shell, for hotter regions of the world. Some of the methods involve altering the ingredients of the chocolate centre, others involve treatment of the shell and others, treatment of both the chocolate centre and the sugar shell.

For instance, attempts have been made to make the chocolate centre more robust by adding water to the centre, which establishes a sugar rather than fat matrix as the backbone of the chocolate structure. Such attempts have

resulted in a chocolate centre that melts at much higher temperatures. However, turning this concept into a commercial reality has proven to be difficult due to the rheological change of the chocolate that takes place (One such change is the dramatic increase in the yield stress of the water added chocolate). Higher melting point fats have also been added to the chocolate formulation in the past in an attempt to increase the melting point of the chocolate centre. However, this can result in chocolate having an undesirable taste or texture.

Over the last five decades, numerous patents have been granted for inventions directed to making chocolate stable at temperatures above the typical melting points of the fats in milk chocolate. Many of the patents seek heat stability by adding water to chocolate, causing amorphous sugars to crystallise, or using noncrystallising amorphous sugars.

US 5149560 involves creating a stable water-in-oil emulsion, for example, a hydrated lecithin, and then adding the emulsion to tempered chocolate to form a heat-stable chocolate.

US 5004623 involves mixing a foam into the tempered paste, and stabilising the foam with either emulsifiers or with a protein to form a heat stable chocolate.

Swiss Patent No. 662041 concerns spraying water directly into mixing chocolate. The chocolate necessarily contains milk powder. The chocolate is said to be heat-stable.

Japanese Patent No. 60-27339 involves imparting heat resistance to chocolate by adding a water-in-oil emulsion just prior to enrobing or moulding.

US 4446166 involves creating heat-resistant chocolate by mixing into chocolate a water-in-fat emulsion.

US 2480935 concerns adding water to chocolate directly, just prior to moulding or enrobing. An emulsifier is recommended to assist in the addition of water to the chocolate. It is considered that heat resistance requires a maximum of 35% fat.

US 2863772 discloses coating sucrose and milk protein with invertase and some water. Heat resistance is obtained after final shaping.

US 2480935 and US2760867 relates to imparting heat stability to chocolate by enveloping the confection in a sugar-crystal mat. This sugar-crystal

mat is induced from sugar bloom and is created by dissolving sugar crystals on the surface of the confection. The sugar syrup is then dried, producing a surface mat of intertwined crystals encasing the confection. By doing so, the confection does not "oil off" when held at temperatures above the melting point of fat.

US 2487931 involves dissolving sugars at elevated temperatures and crystallisation of the sugars when the chocolate mass is cooled to room temperature. The resultant confectionery does not deform at any temperature below the charring point of sugar.

Treatments of the sugar shell have involved varying shell configurations and formulations aimed at making the shell more pliable and resistant to increased internal pressure.

Copending International Patent Application No. PCT/AU01/00452 describes a shelf-stable confectionery product comprising low density, tempered chocolate surrounded by a sugar-based coating. The density of the chocolate core of International Patent Application No. PCT/AU01/00452 is in the range of about 0.6 to 1.25 g/ml. That low density chocolate is made by traditional tempering of the chocolate mix (typically in a temper kettle) and then reducing the density by incorporating gas into the tempered chocolate mix. The gas is incorporated by rapid mixing of the tempered chocolate mix whilst pumping gas into the chocolate mix.

It has now been surprisingly found that, by omitting the temper-kettle step of the process of International Patent Application No. PCT/AU01/00452, a confectionery product having even better shelf and heat stability is produced. In the present invention there is less variation of bubble size throughout the chocolate mix (and subsequent chocolate core). Also, on average the bubble size throughout the chocolate mix of the present invention is smaller than that of International Patent Application No. PCT/AU01/00452, and the bubbles have a more homogeneous distribution. This bubble arrangement results in a chocolate core of more constant rheology than the chocolate core of Application No. PCT/AU01/00452.

OBJECTS OF THE INVENTION

It is an object of the invention to provide a confectionery product having a chocolate centre and sugar-based coating, which has improved shelf stability

even at elevated ambient temperatures compared to existing such confectionery products.

It is a further object of the invention to provide a method for manufacturing such a shelf stable confectionery product having a chocolate centre and a sugar-based coating.

SUMMARY OF THE INVENTION

The present invention is based on the discovery that a confectionery product which is stable even at elevated ambient temperatures can be made by using a low density chocolate as the chocolate core of the confectionery product within a sugar-based outer coating, without having to modify the chemical composition of the chocolate core or the coating. The low density chocolate is a chocolate comprising voids within the chocolate. The invention involves the recognition that, during a phase change from the solid polymorphic state to the liquid chocolate state, and when the chocolate is located within an outer coating (or shell), the expansion in volume of the chocolate compresses pockets of gaseous fluid within the confectionery product core rather than expanding beyond the volume defined by the coating.

According to a first embodiment of the invention there is provided a shelf-stable confectionery product comprising a chocolate core and a sugar-based coating, characterised in that the chocolate core is dispersed with gas bubbles having an average diameter of less than 25 microns. Typically, the average diameter of the gas bubbles is about 21 microns.

According to a second embodiment of the invention there is provided a process for preparing a shelf-stable confectionery product comprising a chocolate core and a sugar-based coating, characterised in that the process comprises the steps (a) to (f) in the specified order:

a) preparing a chocolate mix;

b) cooling said chocolate mix to form a cooled chocolate mix;

c) transferring said cooled chocolate mix into a mixing chamber;

d) in said mixing chamber, incorporating gas into said chocolate mix to form a low density chocolate;

e) extruding the low density chocolate onto one or more chilled moulding rolls and moulding said low density chocolate into a desired shape;

f) coating said moulded, low density chocolate with a sugar-based coating to form said shelf-stable confectionery product.

According to a third embodiment of the invention there is provided a confectionery product comprising a chocolate core and a sugar-based coating, characterised in that the product is produced by the steps (a) to (f) in the specified order:

a) preparing a chocolate mix;

b) cooling said chocolate mix to form a cooled chocolate mix;

c) transferring said cooled chocolate mix into a mixing chamber;

d) in said mixing chamber, incorporating into said chocolate mix to form a low density chocolate;

e) extruding the low density chocolate onto chilled moulding rolls and moulding said low density chocolate into a desired shape;

f) coating said moulded low density chocolate with a sugar-based coating to form said confectionery product.

The density of the chocolate core is lower than the density of the chocolate core of similar types of "non-aerated" prior confectionery products, such as SMARTIES® and earlier types of M&M's® (which typically had a density of about 1.28 – 1.31g/ml) and hence the chocolate is referred to as "low density" chocolate.

Definitions

When used in the description and claims, the following terms have the meanings given below:

The term "shelf-stable" means that the confectionery is stable even at elevated ambient temperatures. That is, the sugar based coating does not show, or shows limited, disfiguring changes, such as cracking or oozing of the chocolate centre out of the confectionery coating.

"Comprises/comprising" and grammatical variations thereof are to be taken to specify the presence of stated features, integers, steps or components or groups thereof, but do not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

The term "chocolate" as used herein is intended to mean not only conventional chocolates, that is those which contain cocoa, a fat such as cocoa,

butter, sugar and optionally milk and flavourings, but also the so-called "white" chocolates which do not contain cocoa. The term is also intended to include products containing cocoa and a fat other than cocoa butter. For example, the chocolate may be "white" chocolate, "dark" chocolate, "milk" chocolate, compound mixture and/or mixtures thereof. In addition, the chocolate can have one or more non-chocolate additive, or inclusion such as nuts, or a flavourant.

The term "chocolate mix" as used herein refers to the mixture of ingredients which make up the chocolate before aeration.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic diagram showing an embodiment of the process according to the invention.

Figure 2 is a schematic diagram showing a preferred embodiment of the process according to the invention.

Figure 3 is a schematic diamgram showing another preferred embodiment of the process according to the invention.

Figure 4 is a graph comparing heat stability test results of the product of the invention, the product of International Application No. PCT/AU01/00452, and "non-aerated" products.

Figure 5 is a "box and whisker" visual representation comparing the percent change in weight at elevated temperatures of the product of the invention, the product of International Application No. PCT/AU01/00452, and "non-aerated" product.

DETAILED DESCRIPTION OF THE INVENTION

The chocolate mix used in the present invention generally comprises standard chocolate-making ingredients known in the art. Typically, the chocolate mix would be made up of cocoa fat in the range of about 20-50% by weight, milk and sugar powders, liquid fats and flavours. As discussed above, it is also possible to include one or more additive, inclusion or flavourant.

The low density chocolate is formed by incorporation of gas pockets into the chocolate mix. The gas may be selected from air, N_2 or CO_2, although for the purposes of the present invention, air has been found to be the most appropriate. Typically, the air is provided in the form of compressed air.

The chocolate mix and the gas which is to be incorporated into the chocolate mix, is led to a mixing chamber via pipes. The pipes are usually jacketed at a predetermined temperature. In addition, the mixing chamber itself is usually jacketed at a given temperature. Preferred jacketing is by means of water or glycol/water, in particular food-grade glycol.

The chocolate mix is cooled usually to about 26°C-29°C before entering the mixing chamber. This cooling may be achieved by means of one or more heat exchangers, typically, a scraped surface heat exchanger. The scraped surface heat exchanger is a single pass or multipass heat exchanger, or a combination of both types.

The gas is typically incorporated into the chocolate mix by pumping of the gas and chocolate mix into the mixing chamber together with rapid mixing of the chocolate mix and gas. It is preferred to add the gas at a rate of about under, or half, the rate at which the chocolate mix is added to the mixing chamber. If the mixing action is not sufficiently rapid, the gas will leave the resulting chocolate/gas mixture when it is exposed to the ambient environment. A preferred type of mixer is a rotor-stator type of mixing head, in particular a high-sheer rotor-stator mixing head, although other mixers known in the art such as a low shear rotor stator mixing heat, a planetary whipper or b-votator would also adequately incorporate the gas into the chocolate.

When a high shear rotor-stator mixing head is used, the rotor preferably moves at above about 70 revolutions per minute. The maximum rotor-stator speed is about 130 revolutions per minute. During mixing, the chocolate/gas mixture usually heats up and a cooling jacket is required to ensure that the outlet temperature of the chocolate/gas mixture is approximately equal to the inlet temperature. The mixing chamber is cooled such that the chocolate, with gas pockets incorporated therein, leaving the mixing chamber is no more than about 33°C.

The chocolate, which has small bubbles of gas incorporated therein, is referred to herein as "low density chocolate". The average bubble size is less than 25 microns, typically about 21 microns, which is smaller, on average, than the bubbles in the chocolate core of the confectionery of International Application PCT/AU01/00452, and with a more homogeneous distribution of bubbles.

The low density chocolate is then moulded to the desired shape and size. A preferred shape is bi-convex, lens-shaped. A preferred size is "bite-size", that is, a piece (or several pieces) which may be put whole into a consumer's mouth. Clearly, however, any desired shape or size would fall within the scope of the invention.

Moulding may be by any process known in the art used to mould confectioneries. In a preferred method, a slab of the low density chocolate is deposited onto chilled moulding rolls. The deposited slab is preferably of approximately constant thickness. The moulding rolls are at a temperature low enough to ensure that the final moulded shapes, after sifting (to remove flashing) and rolling (to smooth edges) are hard enough to withstand the sugar-coating process. Typically, the temperature of the chilled moulding rolls is in the range -18 to -15°C.

Typically, the sifting and rolling occur simultaneously in a rotating sieve, although these procedures could be carried out separately.

The moulded shapes are then coated with a sugar-based coating by conventional means. The sugar-based coating may comprise one or more sugar-based layers. Preferably, more than one sugar-based layer is applied using a lamination process. Most preferably, at least one layer comprising sugar and water is applied, followed by layers comprising sugar, water and colours. It is usual in such a process to allow each layer to dry before adding the next layer. This layering process is repeated as many times as is required, depending on the final desired shell thickness. The final shell thickness is typically about 10-50% by weight of the confectionery and is desirably of even thickness throughout. It is usual to polish the finished confectionery before packaging. Printing may be added to the polished surface, and different coloured confectionery pieces blended together.

Figure 1 shows a schematic diagram of a preferred embodiment of the process of this invention. The basic chocolate ingredients are mixed to form a chocolate mix (1). The chocolate mix (1) and food grade, filtered, compressed air (2) are fed into a mixing chamber (3). The compressed air (2) is delivered at a pressure higher than the pressure in the mixing chamber. The pipework to the mixing chamber and the mixing chamber itself is cooled with jacketing water (4) to

ensure that the outlet temperature of the aerated chocolate leaving the mixing chamber is equal to, or only slightly above, the inlet temperature of the chocolate mix/air. In this preferred embodiment the mixing chamber comprises a rotor-stator mixing head which mixes the compressed air into the chocolate by a whipping-type of action. This whipping action incorporates small bubbles of air into the chocolate to form aerated chocolate (5). The aerated chocolate is then pumped into an adjustable high-pressure manifold (6), from which it is deposited onto chilled moulding rolls (7). The chilled moulding rolls have a heated wedge in the rolls to overcome the increased yield stress of the aerated chocolate. A cooled slab of the aerated chocolate is formed (8), which is then moulded into shapes (9). The moulded shapes are then sifted and rolled (10), followed by coating with several coats of sugar-based coating (11), thereby forming the confectionery according to the invention. The pieces of confectionery may then be polished (12). Different colours of the confectionery pieces can then be mixed together (13).

In an even more preferred embodiment to the process described in Figure 1 above, the chocolate mix is cooled to about 26-29°C before being fed into mixing chamber (3). By cooling the chocolate mix, the mixing head speed can be increased, which results in even more, smaller, bubbles of air.

Yet another preferred embodiment of the above-described process is shown in Figure 2. In this preferred embodiment the chocolate mix is pumped from a storage container (21) into a sieve (22) and then through a scraped surface heat exchanger (23) into an aeration device (24) where aeration of the chocolate mix takes place. After the aeration device (24), the aerated chocolate mix is fed to a pressurised manifold (25), from where the aerated chocolate mix is deposited into a set of chilled depositing rolls (26). In this preferred embodiment, the temperature of the chocolate mix when it leaves the storage container (21) is usually >45°C, and after passing through the scraped surface heat exchanger (23) the temperature of the chocolate mix is in the region of 26-29°C. In yet another preferred embodiment a second heat exchanger (23A) can be included before the scraped surface heat exchanger (23). The second heat exchanger (23A), typically a single pass heat exchanger, assists in cooling the chocolate mix a certain amount before entering the scraped surface heat exchanger (23). Thus

the chocolate mix is passed from the sieve (22) through two heat exchangers (23A) and (23) before being fed into the aeration device (24). By increasing the mixer head speed to above about 70 rpm in the aeration device (24), smaller bubbles of gas having a more homogeneous distribution throughout the chocolate, and in the final chocolate core, than in the process disclosed in International Patent Application No. PCT/AU01/00452 are achieved.

In an even more preferred embodiment, the heat exchanger (23) or heat exchangers (23) and (23A) can be replaced by a cooling unit (23B) which has several cooling zones which cool the chocolate mix to a specified temperature. This preferred embodiment is represented in Figure 3.

Tests show the finished confectionery to be shelf stable, even up to 60-65°C. In typical warmer climates, for example at about 35-40°C, the degree of cracking, disfigurement and oozing out of the chocolate centre and/or fat bleed is minimal, if it occurs at all. Even if the finished product is dropped and the shell cracks as a result of this, limited, if any, oozing form the chocolate centre occurs. Furthermore, even at temperatures up to about 60°C, the majority of the confectionery products show no oozing or fat bleed. The confectionery has the desired taste, texture and mouthfeel. In addition, it has been found that there are less irregularities in the shapes of the product produced by the present invention than similar prior art products, including those of International Application No. PCT/AU01/00452. It is believed that this improved regularity in final product is due to smaller bubbles which are more evenly distributed throughout the chocolate mix than in these prior art products.

The invention will now be described with reference to the following example, which is not intended to limit the scope of the invention.

Example

Manufacture of Chocolate

Firstly, mixtures of milk and sugar powders are refined. Powdered flavours are then added to this mixture. The powders are then added to controlled amounts of liquid fats with a pin mixer. Typically, a fat content of between 20% - 50% is used, with a hard to soft fat ratio between 2 - 5. After the refining of powders and the mixing of the powders and liquids, the majority of particle sizes occur between about 20 - 75 microns. The temperature of the chocolate mix at this stage is in the range of about 45°C.

The chocolate mix is then passed through a sieve, and then into the cooling unit. The first zone of the cooling unit is set to achieve a temperature of the chocolate mix of 45°C. The next zone is set at 27°C. Hence the temperature of the chocolate mix at the outlet is ideally about 27°C.

Following the cooling unit, the chocolate mix at a temperature of ideally about 27°C, is fed to the aeration device. In the aeration device, an air stream is added to the chocolate mix stream at an ideal rate of under, or around half, that of the rate of addition of the chocolate mix. The combined air and chocolate mix are then mixed vigorously with a rotor-stator, the rotor moving at above about 70 revolutions per minute. The mixing chamber pressure is super-atmospheric and the pressure of the incoming air is greater than that of the mixing chamber.

The rotor-stator is cooled with 15°C – 25°C jacketing water with the result the temperature of the aerated chocolate leaving the mixing chamber is about 30-32°C.

Following the mixing chamber, the aerated chocolate passes through jacketed pipework to a manifold, that can be manually altered to change the back-pressure to the mixing chamber.

From the manifold, the aerated chocolate mix is deposited onto chilled moulding rolls. The chilled moulding rolls turn at from about 400-700 revolutions per minute. The rolls are cooled with either water or a glycol-water mix, ideally in the range of about -18 to -15°C, such that the ideal temperature of the chocolate leaving the rolls is between 5 - 16°C. A web of bi-convex, lens-shaped cores is formed.

The aerated moulded chocolate is then cooled in a cooling tunnel, typically using procedures known in the art.

The moulded chocolate then enters a rotating sieve, which removes the flashing from the bi-convex, lens-shaped chocolate cores.

Coating the Product

The smooth, correctly shaped product is then coated with a layer comprising sugar and water. The coating is done using any process equipment that can achieve a desired, even thickness of shell with an appropriate finished water activity (ideally around 0.25) in a commercially feasible time.

After this layer has dried, further layers comprising sugar and water may be applied, and dried, followed by layers comprising sugar, water and colours. After each layer has dried, further syrup is added, which completely covers the coated pieces, and then is dried. The desired finished shell percentage to chocolate percentage is achieved by repeating this step as many times as is required. The shell percentage will generally fall between 10% – 50% by weight. The sugar shell completely covers the finished piece.

The finished product is then polished and different coloured finished pieces are blended together. Pieces may then have printed symbols added to their polished surface, before the product is packed out.

The finished bite size confection exhibits shelf stability even at elevated ambient temperatures. Tests show the product to be shelf stable even above 60°C.

Comparative Example 1

The heat stability of confectionery products of the present invention was compared with the heat stability of confectionery products prepared by (1) the process described in International Application No. PCT/AU01/00452 and (2) Confectionery products made using non-aerated chocolate.

The testing method was as follows:

i) A convective airflow oven was set at a given temperature.

ii) A layer of '2 ply' tissues was placed on top of an indented plate (a Perspex plate is often used).

iii) Product was placed on the plate such that trial and control product were evenly distributed over the plate.

iv) Each individual piece was weighed using a Metler Toledo Halogen Moisture Analyser (the scale part only). The location (on the plate) and weight of each piece was recorded. Also, it was noted if product was cracked before the test.

v) About 90 pieces were placed on the plate.

vi) Each piece was measured in height and diameter using a digital calliper (optional).

vii) A layer of '2 ply' tissue was then placed on top of the product and a second plate placed on top. Care was taken to form the tissues around the pieces as close as possible (so if product did fat bleed, the fat would be absorbed by the tissue).

viii) The product and plate were then placed in the oven for a given duration. The temperature in the oven was logged using a Fluke II digital thermometer device.

ix) Product was taken from the oven and left to sit in ambient conditions for approximately ½ an hour (this was done to further allow fat to be absorbed by the tissues).

x) Each piece was then weighed and inspected (using a magnifying glass) for cracks and fat bleed.

This same test was carried out for the product of the present invention, the product of International Application No. PCT/AU01/00452 and prior art sugar coated confectionery products (M&M's) in which the chocolate was not aerated.

Figure 4 is a graph showing the temperature (°C – *x* axis) plotted against % Fat bleed (*y* axis).

Figure 5 is a "box and whisker" visual representation showing the % change in weight of non- aerated samples, samples of International Application No. PCT/AU01/00452 and the present invention at elevated temperature.

As can be seen from Figure 4 the product of the present invention showed considerably lower fat bleed to both prior art products after 1 hour. Other tests showed that even after 17 and 24 hours the product of the present invention showed markedly better results than the two prior art products. Also, as can be seen from Figure 5, the % change in weight of the product of the present invention at elevated temperatures is far lower than both other prior products.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A shelf-stable confectionery product comprising a chocolate core and a sugar-based coating, characterised in that the chocolate core is dispersed with gas bubbles having an average diameter of less than 25 microns.

2. A shelf-stable confectionery product according to claim 1 wherein the average diameter of the gas bubbles is about 21 microns.

3. A shelf-stable confectionery product according to claim 1 or claim 2 wherein the gas bubbles are dispersed substantially homogenously throughout the chocolate core.

4. A shelf-stable confectionery product according to any one of claims 1 to 3, wherein said gas is air.

5. A shelf-stable confectionery product according to any one of claims 1 to 4, wherein the chocolate core comprises about 20-50% by weight cocoa fat, milk powder, sugar powder, liquid fat and flavour.

6. A shelf-stable confectionery product according to any one of claims 1 to 5, wherein the sugar-based coating comprises at least one layer comprising sugar and water, coated with at least one layer comprising sugar, water and colour.

7. A shelf-stable confectionery product according to any one of claims 1 to 6, which is bite-sized.

8. A shelf-stable confectionery product substantially as herein described with reference to the Example.

9. A process for preparing a shelf-stable confectionery product comprising a chocolate core and a sugar-based coating, characterised in that the process comprises the steps (a) to (f) in the specified order:

a) preparing a chocolate mix;

b) cooling said chocolate mix to form a cooled chocolate mix;

c) transferring said cooled chocolate mix into a mixing chamber;

d) in said mixing chamber, incorporating gas into said chocolate mix to form a low density chocolate;

e) extruding the low density chocolate onto one or more chilled moulding rolls and moulding said low density chocolate into a desired shape;

f) coating said moulded, low density chocolate with a sugar-based coating to form said shelf-stable confectionery product.

10. A process according to claim 9, wherein said gas is incorporated into said chocolate mix by rapid mixing of said chocolate mix together with said gas.

11. A process according to claim 9 or claim 10, wherein said rapid mixing is carried out by a mixing head moving at above about 70 revolutions per minute.

12. A process according to any one of claims 9 to 11 wherein step (b) comprises cooling the chocolate mix to about 27°C.

13. A process according to any one of claims 9 to 12, wherein the low density chocolate is dispersed with gas bubbles having an average diameter of less than microns.

14. A process according to claim 13 wherein the average diameter is about 21 microns.

15. A process according to claim 13 or claim 14 wherein said gas bubbles are dispersed substantially homogeneously.

16. A process according to any one of claims 9 to 15, wherein step (e) includes forming said low density chocolate into a slab of approximate constant thickness.

17. A confectionery product comprising a chocolate core and a sugar-based coating, characterised in that the product is produced by the steps (a) to (f) in the specified order:

a) preparing a chocolate mix;

b) cooling said chocolate mix to form a cooled chocolate mix;

c) transferring said cooled chocolate mix into a mixing chamber;

d) in said mixing chamber, incorporating into said chocolate mix to form a low density chocolate;

e) extruding the low density chocolate onto chilled moulding rolls and moulding said low density chocolate into a desired shape;

f) coating said moulded low density chocolate with a sugar-based coating to form said confectionery product.

18. A confectionery product according to claim 17 wherein said gas is air.

19. A confectionery product according to claim 17 or claim 18 wherein step (d) consists of rapid mixing of said chocolate mix together with said gas.

20. A confectionery product according to claim 19, wherein the mixing is with a mixing head beating at above about 70 revolutions per second.

21. A confectionery product according to any one of claims 17 to 20 wherein step (b) comprises cooling the chocolate to about 27°C.

22. A confectionery product according to any one of claims 17 to 21, wherein step (e) includes forming said low density chocolate into a slab of approximate constant thickness.

23. A process for preparing a confectionery product, which process is substantially as herein described with reference to the Example.

24. A process for preparing a confectionery product, which process is substantially as herein described with reference to Figure 1 or Figure 2.

25. A confectionery product comprising a chocolate core and a sugar-based coating produced by the process of claim 23 or claim 24.

DATED this 23rd day of December 2002

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ABSTRACT

A confectionery product comprising low density chocolate surrounded by a sugar-based coating, and a process for producing the confectionery product. The confectionery product is shelf stable, even at elevated ambient temperatures.

FIGURE 1

FIGURE 1

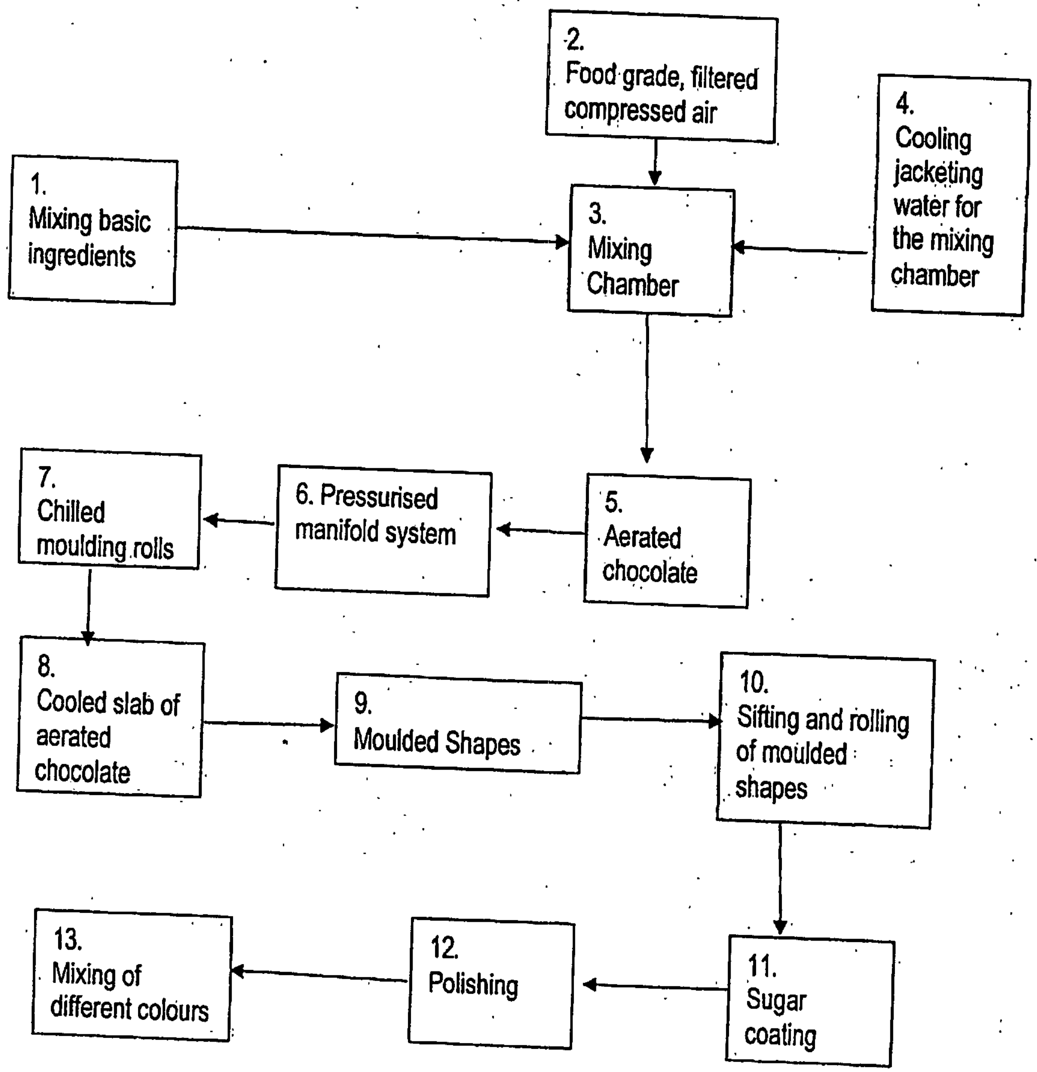
1.
Mixing basic ingredients
2.
Food grade, filtered compressed air
3.
Mixing Chamber
4.
Cooling jacketing water for the mixing chamber
5.
Aerated chocolate
6. Pressurised manifold system
7.
Chilled moulding rolls
8.
Cooled slab of aerated chocolate
9.
Moulded Shapes
10.
Sifting and rolling of moulded shapes
11.
Sugar coating
12.
Polishing
13.
Mixing of different colours

FIGURE 2

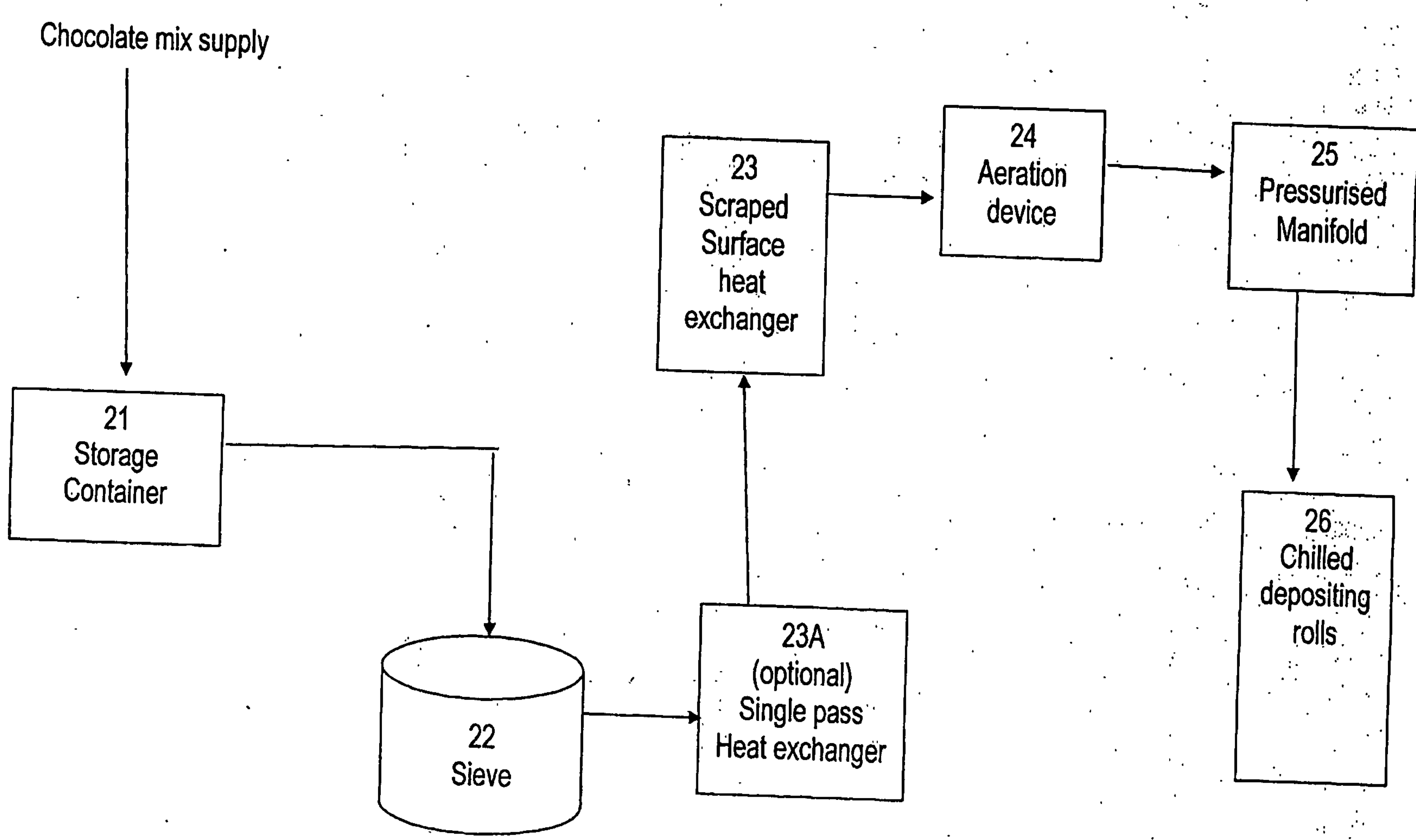
Chocolate mix supply
21
Storage
Container
22
Sieve
23A
(optional)
Single pass
Heat exchanger
23
Scraped
Surface
heat
exchanger
24
Aeration
device
25
Pressurised
Manifold
26
Chilled
depositing
rolls

FIGURE 3

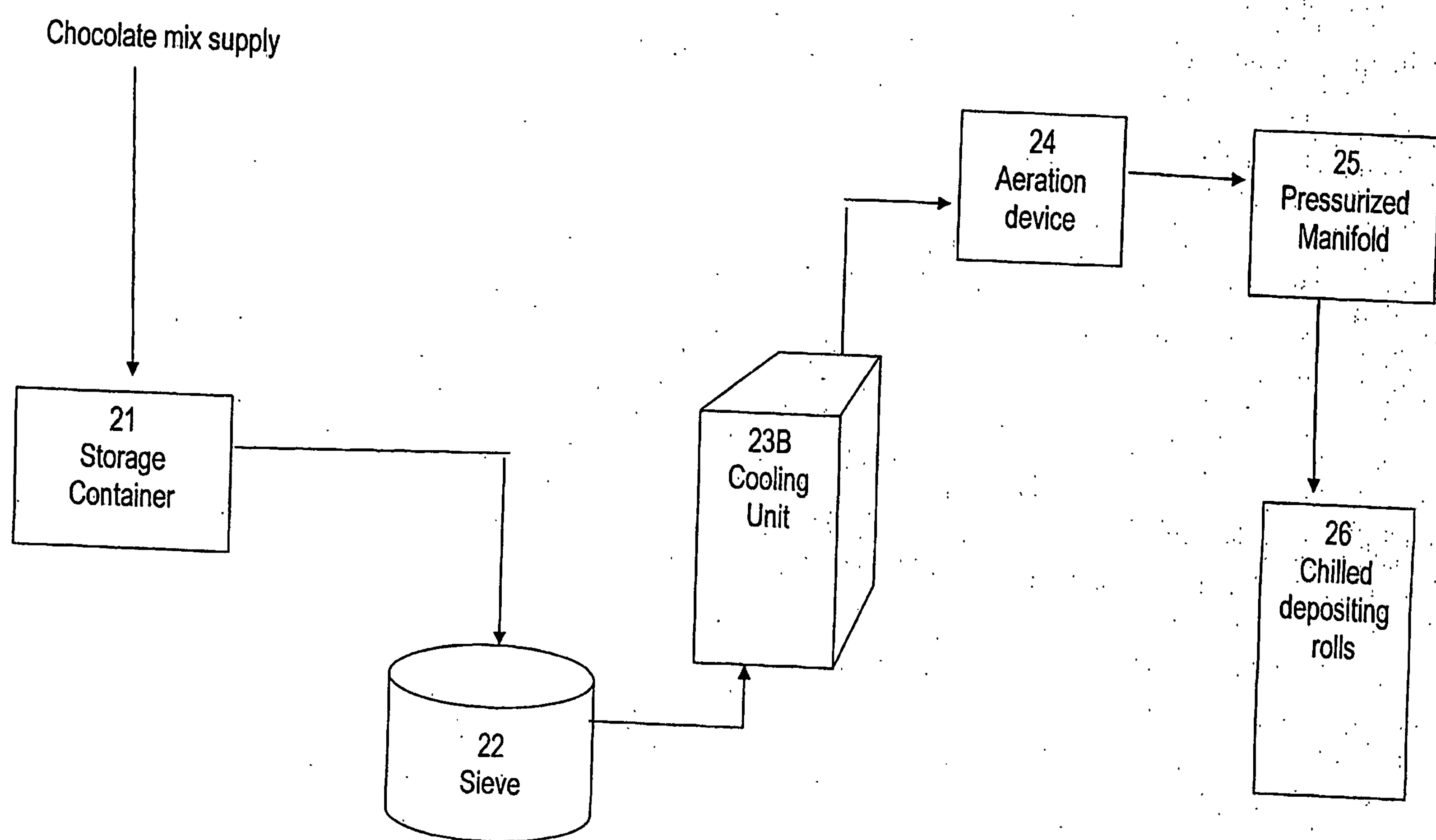
Chocolate mix supply
21
Storage
Container
22
Sieve
23B
Cooling
Unit
24
Aeration
device
25
Pressurized
Manifold
26
Chilled
depositing
rolls

FIGURE 4

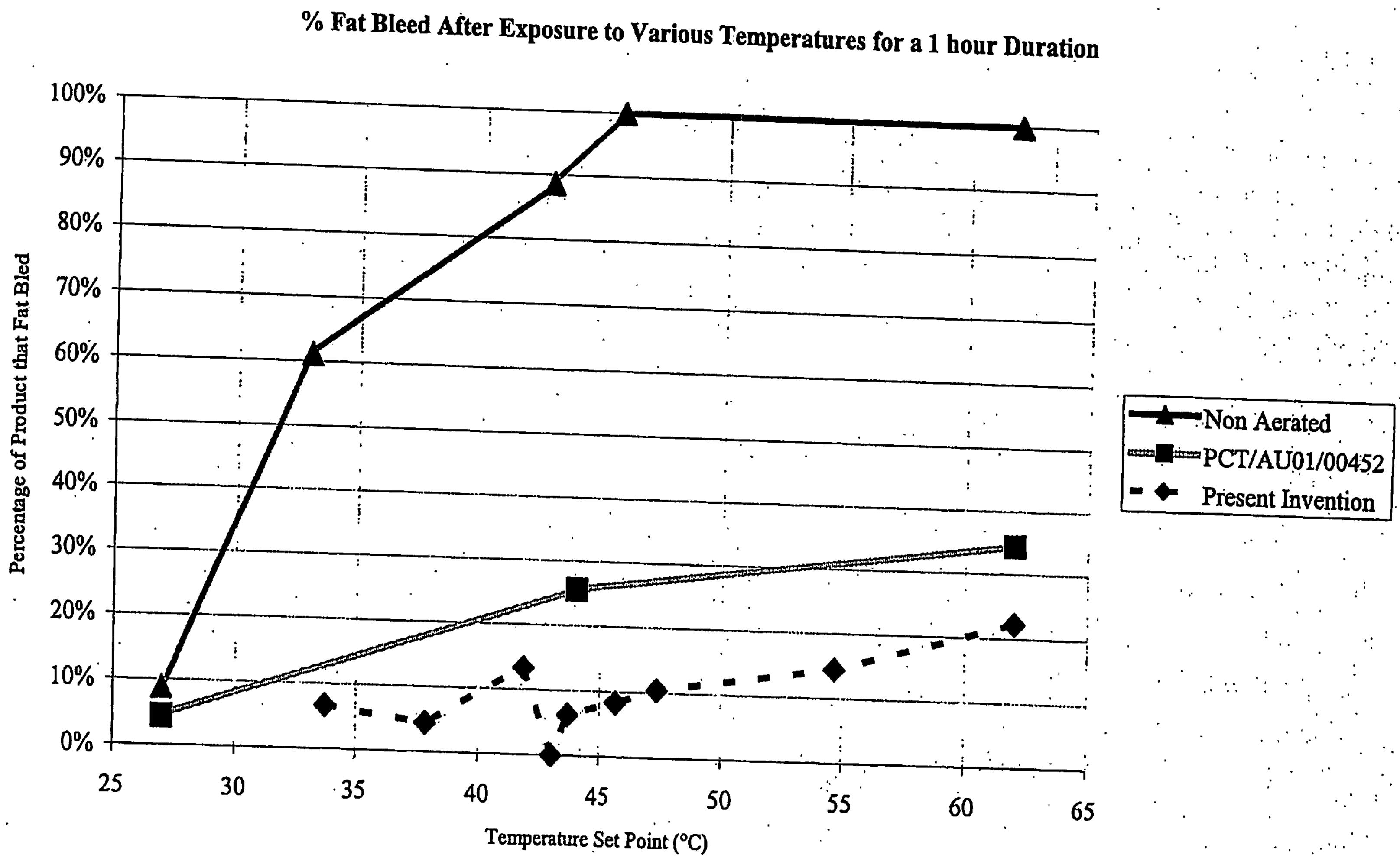
% Fat Bleed After Exposure to Various Temperatures for a 1 hour Duration
Percentage of Product that Fat Bled
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
25
30
35
40
45
50
55
60
65
Temperature Set Point (°C)
Non Aerated
PCT/AU01/00452
Present Invention

FIGURE 5 – Non Handling Cracked Product Before Oven